WHAT IS CLAIMED IS:

1. A nucleic acid extraction device, comprising:

a body having at least one chamber with at least one inlet channel; and

a porous flow-through plug disposed within the chamber, the plug having nucleic acid binding properties.

2. The nucleic acid extraction device of claim 1, wherein said chamber has a width in the range of 0.05 to 2.0mm.

3. The nucleic acid extraction device of claim 2, wherein said chamber has a width in the range of 0.1 to 0.5mm.

4. The nucleic acid extraction device of claim 3, wherein said chamber has a depth in the range of 0.05 to 1mm.

5. The nucleic acid extraction device of claim 1, wherein said plug is a deformable plug.

6. The nucleic acid extraction device of claim 1, wherein the plug comprises glass wool.

7. The nucleic acid extraction device of claim 5, wherein the plug comprises glass wool.

8. A nucleic acid extraction device, comprising:

a body having at least one chamber and at least one inlet channel; and

a textured surface disposed within the chamber, the surface having nucleic acid binding properties.

9. A nucleic acid extraction device, comprising:

a body having at least one chamber and at least one inlet channel; and

an affinity surface having particles attached thereto, the particles having nucleic acid binding properties.

10. The device of claim 1, wherein the plug is pretreated with an agent for enhancing the nucleic acid binding properties.

11. The device of claim 10, wherein said agent is selected from the group consisting of acids, bases, silanes, polysine, tethered antibodies, synthesized nucleic acids, and Poly-T DNA.

12. The device of claim 10, wherein the structure is an open cell foam.

13. The nucleic acid extraction device of claim 5, further comprising:

a flexible diaphragm for compressing said plug thereby removing trapped liquids.

14. The nucleic acid extraction device of claim 13, wherein

the flexible diaphragm is disposed between a pneumatic port and the structure, the device further comprising a pressure system for displacing the flexible diaphragm to draw a sample through the inlet channel into the chamber.

15. The nucleic acid extraction device of claim 1, wherein said structure is an affinity surface in a flow through chamber.

16. The nucleic acid extraction device of claim 9, wherein said affinity surface has controlled-pore glass structures attached thereto.

17. The nucleic acid extraction device of claim 9, wherein said affinity surface has glass spheres attached thereto.

18. The nucleic acid extraction device of claim 9, wherein said affinity surface has cellulose particles attached thereto.

19. The nucleic acid extraction device of claim 8, wherein said affinity surface is microfabricated.

20. The nucleic acid extraction device of claim 8, wherein said affinity surface is machined.

21. The nucleic acid extraction device of claim 8, wherein said affinity surface is injection molded.

22. The nucleic acid extraction device of claim 1, further comprising:

a piezoelectric crystal adapted to acoustically agitate said sample.

23. A method for extracting nucleic acid from a sample comprising:

positioning the sample in a miniature chamber having a structure with nucleic-acid binding properties disposed therein;

binding nucleic acid from the sample to the structure; and

drawing the sample from the miniature chamber.

24. The method for extracting nucleic acid from a sample as set forth in claim 22, wherein

said structure is a porous fluid plug, and

said binding step is accomplished by passing the sample through the structure.

25. The method for extracting nucleic acid from a sample as set forth in claim 22, further comprising the step of:

pretreating the structure with an agent for enhancing the nucleic acid binding properties.

26. The method for extracting nucleic acid from a sample as set forth in claim 22, wherein

said agent is selected from the group consisting of acids, bases, silanes, polylysine, tethered antibodies, and Poly-T DNA.

27. A biological sample refinement device, comprising:

a body having at least one microchamber with at least one inlet channel;

a structure disposed within the microchamber, the structure having binding sites thereon; and

a fluid distribution system for delivering a biological sample into the microchamber such that at least a portion of the sample contacts the binding sites.

28. The device of claim 27 wherein the binding sites are antibodies that are adhesively attached to the structure.

29. The device of claim 27 wherein the binding cites are oligonucleotides attached to the structure.

30. The device of claim 27 wherein the structure comprises a substantially planar wall with a plurality of beads attached thereto.

31. A deformable microchamber device, comprising:

a pneumatic portion having an addressable port formed therein,

a fluid portion having a reaction chamber formed therein,

said pneumatic portion and said fluid portion being bonded together with said addressable port being positioned in mating contact over said reaction chamber, and

a deformable member disposed between said pneumatic portion and said fluid portion, said deformable member acting as a flexible chamber wall which seals the reaction chamber.

32. A method of forming a molded microcapillary, comprising the sequential steps of:

forming a mold part,

depositing a first parylene layer on a substrate part,

affixing said mold part to said substrate,

depositing a second parylene layer on said mold part and said substrate,

removing said mold part from said substrate.

33. The method of forming a molded microcapillary in claim 32, wherein:

said step of depositing a second parylene layer is accomplished by depositing parylene into cavities on said mold part.

34. The method of forming a molded microcapillary in claim 32, wherein:

said step of removing said mold part from said substrate is accomplished by dissolving a release layer coated on said mold part.

35. A hermetically sealed microfluidic system, comprising:

a body having at least two reaction chambers connected by a fluidic channel disposed therebetween,

a pneumatic port connected to said chamber, said pneumatic port having a gas-liquid separator disposed therein,

a pneumatic line, and

a deformable diaphragm sealing said pneumatic port from said pneumatic line.

36. The hermetically sealed microfluidic system as set forth in claim 35, wherein:

said gas-liquid separator is a porous hydrophobic vent.

37. The hermetically sealed microfluidic system as set forth in claim 35, wherein:

said deformable diaphragm is selected from the group consisting of latex, polymidemide, polypropylene, and mylar.

38. The hermetically sealed microfluidic system as set forth in claim 35, wherein:

said deformable membrane covers said gas-liquid separator.

39. The hermetically sealed microfluidic system as set forth in claim 35, further comprising:

a pneumatic manifold connected to said second pneumatic port at each of said at least one reaction chambers.

40. The hermetically sealed microfluidic system as set forth in claim 35, further comprising:

a pneumatic driving chamber connected to said pneumatic port, said pneumatic driving chamber having a displaceable pneumatic driving chamber vent for inducing pressure changes in said pneumatic port.

41. A microfluidic particle suspension valving arrangement, comprising:

a flow chamber having a narrow hydrophobic region,

a particle emulsion disposed in said narrow region, said particle emulsion being immiscible in water, and generally occluding said narrow hydrophobic region.

42. The microfluidic particle suspension valving arrangement of claim 41, wherein

the viscosity of said particle emulsion can be varied by a magnetic field.

43. The microfluidic article suspension valving arrangement of claim 41, wherein

the viscosity of said particle emulsion can be varied by an electric field.

44. In a microfluidic fluid system, an enzymatic reaction selected from the group consisting of terminal deoxy-transferase, DNAase, in vitro translation, and ligation.

45. A low-volume hybridization chamber, comprising:

a base,

a reaction chamber disposed in said base, said reaction chamber being bound by a flexible diaphragm, and

a probe array disposed in said reaction chamber.

46. The low-volume hybridization chamber of claim 45, wherein

said reaction chamber has a volume in the range of 0.1 to 100$\mu\ell$.

47. The low-volume hybridization chamber of claim 45, wherein

said reaction chamber has a volume in the range of 1 to 20μl.

48. The low-volume hybridization chamber of claim 1, further comprising:

a pneumatic system for moving said flexible diaphragm.

49. A hybridization device, comprising:

a base,

a fluidic chamber disposed in said base, said fluidic chamber having a hybridization array disposed therein,

a porous membrane disposed in said fluidic chamber opposite said array,

a pneumatic port disposed in said base, said pneumatic port addressing said porous membrance, and

a thermal control device for controlling the temperature in the array.

50. A miniature genetic analysis system comprising: a body having at least one reaction chamber disposed therein;

an addressable heater adjacent to or within each chamber;

a thermal insulation in contact with said heater;

a cooler coupled to said thermal insulator and disposed to cool each of the reaction chambers;

a temperature sensor positioned adjacent said heater; and

a temperature controller.

51. The system of claim 50 wherein the insulator comprises a polymeric film having a thickness of about 0.1 mm to about 1.0 mm.

52. A method for linking together two spaced-apart fluid plugs disposed in a first capillary tube, wherein said first capillary tube intersects a second capillary tube having a gas-liquid separator extending therefrom, comprising:

moving said first fluid plug along said first capillary tube such that a leading edge of said first fluid plug moves into said second capillary tube and reaches said gas-liquid separator with a trailing edge of said first fluid plug remaining in said first capillary tube,

forcing gas through said gas-liquid separator thereby expelling fluid from said second capillary tube, and

moving a second fluid plug along said first capillary tube towards said leading edge of said first fluid plug tube such that a leading edge of said second fluid plug moves into said second capillary tube with a trailing edge of said second fluid plug remaining in said first capillary tube.

53. A device for removing gas bubbles and linking together fluid plugs in a microfluidic system, comprising:

an elongated chamber having a wide portion and a narrow portion,

a first input port opening into the narrow portion of said elongated chamber, and

a gas exhaust port opening into the wide portion of said elongated chamber.

54. The device for removing gas bubbles and linking together fluid plugs in a microfluidic system as set out in claim 53, further comprising:

a second input port opening into the wide end of said elongated chamber.

55. The device for removing gas bubbles and liking together fluid plugs in a microfluidic system as set out in claim 53, wherein:

said elongated chamber has a narrowed width portion extending along its longitundinal length.

56. A method for removing gas bubbles and linking together fluid plugs in a microfluidic system, comprising:

exerting a pressure differential to move a capillary stream consisting of spaced apart fluid plugs with gas bubbles inter-disposed therebetween into a narrow portion of an elongated chamber, and

removing said gas bubbles from said elongated chamber through a port connected to a wide portion of said elongated chamber, wherein said wide portion is positioned opposite said narrow portion.

57. A method for removing gas bubbles and linking together fluid plugs in a microfluidic system, comprising:

exerting a pressure differential to move a capillary stream consisting of spaced apart fluid plugs with gas bubbles inter-disposed therebetween into a wide end of an elongated chamber, and

removing said gas bubbles from said elongated chamber through a port connected to a narrow end of said elongated chamber, wherein said wide end is positioned opposite said narrow end.

58. A device for manipulating nucleic acids in a sample, comprising:

a base defining a reaction chamber,

a first chamber extending from said reaction chamber, said first chamber having a first electrode received therein,

a second chamber extending from said reaction chamber, said second chamber having a second electrode received therein, and

a first barrier disposed between said reaction chamber and said first chamber, and

a second barrier disposed between said extraction chamber and said second chamber.

59. A microfluidic controlled pH device, comprising:

a reaction chamber,

a first and second electrode disposed in said reaction chamber,

a counter-electrode chamber in fluid connection with said reaction chamber, said counter-electrode chamber and said reaction chamber having a barrier disposed therebetween, and

a fourth electrode.

60. A microfluidic acoustic treatment device, comprising:

a chamber having formed in a polymeric base, said chamber having a lower surface with a plurality of microstructures formed therein and a thin upper wall,

an acoustic source coupled to said reaction chamber.

61. A device for acoustic manipulation of biological particles, comprising:

an array of transducers for producing acoustic standing waves.

62. The device for acoustic manipulation of biological particles of claim 61, wherein:

said transducers comprise surface-acoustic wave transducers.

63. The device for acoustic manipulation of biological particles of claim 61, wherein:

said transducers comprise flexural plate wave transducers.

64. A method of providing a measured dose of fluid into a common line in a capillary system, comprising:

pressurizing a common line to cause a fluid plug to enter a sealable chamber intersecting said common line,

holding the fluid plug in said sealable chamber by closing a valve positioned on said sealable chamber proximal the intersection of said sealable chamber and said common line,

evacuating said common line, and

opening said valve to permit a measured dose of fluid to move from said sealeable chamber to said common line.

65. A device for linking fluid plugs in a microfluidic system, comprising:

a first capillary tube having two valves positioned therealong, and

a second capillary tube extending from said first capillary tube and having a gas-liquid separator positioned therealong.